Test Report

Verified code: 081777

Report No.: E20230331478001-8

Customer:	Lumi United Technology Co., Ltd
Address:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
Sample Name:	Hub M3
Sample Model:	HM-G01E
Receive Sample Date:	Aug.02,2023
Test Date:	Nov.16,2023 ~ Dec.06,2023
Reference Document:	EN 50665:2017
Test Result:	Pass

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GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-01-04

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Statement

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2. The sample information is provided by the client and responsible for its authenticity; The content of the report is only valid for the samples sent this time.

3. When there are reports in both Chinese and English, the Chinese version will prevail when the language problems are inconsistent.

4. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.

5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20230331478001-8	Original Issue	2023-12-22

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1. GENERAL DESCRIPTION OF EUT

1.1 APPLICANT INFORMATION

Name:	Lumi United Technology Co., Ltd
Address:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

1.2 MANUFACTURER

Name:	Lumi United Technology Co., Ltd
Address:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

1.3 BASIC DESCRIPTION OF EUT

Product Name:	Hub M3
Product Model:	HM-G01E
Adding Model:	HM-G01D
Models Difference:	The model NO. HM-G01E & HM-G01D have the same technical construction including circuit diagram, PCB LAYOUT, hardware version and software version identical, except sales area and packaging are different.
Trade Name:	Aqara
Power supply:	DC 5V/2A or PoE input: DC 48V/0.27A
Frequency Band:	2402MHz - 2480MHz for BLE GFSK; 2405MHz - 2475MHz for Zigbee O-QPSK 2405MHz - 2475MHz for Thread O-QPSK 2412MHz - 2472MHz for 2.4G WIFI IEEE 802.11b/g/n HT20; 2422MHz - 2462MHz for 2.4G WIFI IEEE 802.11n HT40; Station: 5180MHz - 5240MHz & 5745MHz - 5825MHz for 5G WIFI IEEE 802.11a/n HT20/ac VHT20; 5190MHz - 5230MHz & 5755MHz - 5795MHz for 5G WIFI IEEE 802.11n HT40/ac VHT40; 5210MHz & 5775MHz for 5G WIFI IEEE 802.11ac VHT80;
Antenna Type:	BLE & Zigbee & Thread & WIFI: PIFA antenna
Antenna Gain:	BLE: Antenna 1: -0.5dBi gain (Max) Zigbee: Antenna 2: 0dBi gain (Max) Thread: Antenna 3: 0.5dBi gain (Max) 2.4G WIFI: Antenna 4: 0dBi gain (Max) 5G WIFI: 5150MHz – 5250MHz Antenna 4: 0.5dBi gain (Max) 5G WIFI: 5725MHz – 5850MHz Antenna 4: 0.2dBi gain (Max)
Hardware Version:	V2.0.5_1060

Software Version:	T0
Sample submitting way:	■Provided by customer □Sampling
Sample No:	E20230331478001-0001
Note 1:	The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.
Note 2:	All the tests were performed on the model HM-G01E.

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2. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

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3. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

China	CNAS(L0446)

Copies of granted accreditation certificates are available for downloading from our web site, http://www.grgtest.com

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4. TECHNICAL REQUIREMENTS SPECIFICATION IN

4.1 RF EXPOSURE EVALUATION

This European Standard applies to electronic and electrical equipment for which no dedicated Harmonized product – or product family standard, or standard relating to low power equipment , regarding human exposure not. Annex A lists such harmonized standards available at the time of writing This list may change with time. The current list of standards harmonized under each directive should be consulted at the time of use of this standard.

The measurements and calculations to demonstrate equipment compliance shall be made according to EN 62311:2008, Clause 4 and 5. The general considerations as defined in EN 62311:2008, Clause 4 and 5 shall apply to all equipment.

The product is deemed to fulfil the requirements of this standard if the calculated and/or measured values are less than or equal to the limits.

NOTE: In the setting of basic restrictions and the derived reference levels, safety factors have been taken into account. In the specification of the assessment method, uncertainty has been constrained. This is the reason for not requiring that the measured values shall be compared to the limit reduced by the measurement uncertainty.

Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz, unperturbed rms values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m^2)
0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	4 000/f	5 000/f	—
0,025-0,8 kHz	250/f	4/f	5/f	—
0,8-3 kHz	250/f	5	6,25	—
3-150 kHz	87	5	6,25	—
0,15-1 MHz	87	0,73/f	0,92/f	—
1-10 MHz	$87/f^{1/2}$	0,73/f	0,92/f	—
10-400 MHz	28	0,073	0,092	2
400-2 000 MHz	$1,375\ f^{1/2}$	$0,0037\ f^{1/2}$	$0,0046\ f^{1/2}$	f/200
2-300 GHz	61	0,16	0,20	10

Notes:

1. f as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, S_{eq}, E^2, H^2, and B^2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, S_{eq}, E^2, H^2, and B^2 are to be averaged over any $68/f^{1.05}$ -minute period (f in GHz).
4. No E-field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

4.2 EVALUATION RESULTS

Mode	Antennna	EIRP Power (dBm)	Frequency Band(MHz)	Power Density (W/m ²)	Limit of Power Density (W/m ²)
BLE-1M	Ant 1	4.14	2402-2480	0.0052	10
BLE-2M	Ant 1	3.98	2402-2480	0.0050	10
Zigbee	Ant 2	6.82	2405-2475	0.0096	10
Thread	Ant 3	6.87	2402-2475	0.0097	10
2.4GWIFI-802.11b	Ant 4	17.38	2412-2472	0.1089	10
2.4GWIFI-802.11g	Ant 4	16.86		0.0966	10
2.4GWIFI-802.11n HT20	Ant 4	17.28		0.1064	10
2.4GWIFI-802.11n HT40	Ant 4	17.24	2422-2462	0.1054	10
5GWIFI-802.11a	Ant 4	16.29	5180-5240	0.0847	10
5GWIFI-802.11n HT20	Ant 4	15.59	5180-5240	0.0721	10
5GWIFI-802.11n HT40	Ant 4	15.30	5190-5230	0.0674	10
5GWIFI-802.11ac VHT20	Ant 4	15.68	5180-5240	0.0736	10
5GWIFI-802.11ac VHT40	Ant 4	15.04	5190-5230	0.0635	10
5GWIFI-802.11ac VHT80	Ant 4	14.30	5210	0.0536	10
5GWIFI-802.11a	Ant 4	12.54	5745-5825	0.0357	10
5GWIFI-802.11n HT20	Ant 4	12.48	5745-5825	0.0352	10
5GWIFI-802.11n HT40	Ant 4	12.01	5755-5795	0.0316	10
5GWIFI-802.11ac VHT20	Ant 4	12.51	5745-5825	0.0355	10
5GWIFI-802.11ac VHT40	Ant 4	11.84	5755-5795	0.0304	10
5GWIFI-802.11ac VHT80	Ant 4	10.05	5775	0.0201	10

Note：
1.The maximum output Power were refer to the RF report.

2.The field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas: *P* watts is radiated, from a point, uniformly over the surface of sphere of radius *R*. Assumed use distance from EUT to Human, **20 cm** separation distance warning is required.

3. The 2.4G wifi and 5G wifi can't simultaneously transmit.

The Formula

$$S = \frac{P}{4\pi R^2}$$

Whereas,
S = power density
R=distance from observation point to the antenna（m）
P= The maximum e.i.r.p of the transmitter（W）.

In this section, the power density at 20 cm location is calculated to examine if it is lower than the limit.

For simultaneously transmit system According to EN62311:2008 sections 8.5 Frequency range from 3 kHz – 300 GHz (IEEE-based):

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the ME toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source (expressed as a plane-wave equivalent power density) to the corresponding ME for the frequency of each source is evaluated. The exposure complies with the ME if the sum of the ratios is less than unity, i.e.,

$$\sum_{i=1}^{n} \frac{S_{E_i}(duty\,factor)}{MPE_{E_i}} < 1$$

and

$$\sum_{i=1}^{n} \frac{S_{H_i}(duty\,factor)}{MPE_{H_i}} < 1$$

For the calculated power density should comply with:

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} < 1$$

For simultaneously transmit result:

Max. BLE + Max. Zigbee + Max. Thread + Max. 2.4G WIFI:
BLE Power Density / Limit of Power Density + Zigbee Power Density / Limit of Power Density + Thread Power Density / Limit of Power Density + 2.4G WIFI Power Density / Limit of Power Density = 0.0052 (W/m ²)/10(W/m ²) + 0.0096 (W/m ²)/10(W/m ²) + 0.0097 (W/m ²)/10(W/m ²) + 0.1089 (W/m ²)/10(W/m ²) = 0.01334<1

Max. BLE + Max. Zigbee + Max. Thread + Max. 5G WIFI:
BLE Power Density / Limit of Power Density + Zigbee Power Density / Limit of Power Density + Thread Power Density / Limit of Power Density + 5G WIFI Power Density / Limit of Power Density = 0.0052 (W/m ²)/10(W/m ²) + 0.0096 (W/m ²)/10(W/m ²) + 0.0097 (W/m ²)/10(W/m ²) + 0.0847 (W/m ²)/10(W/m ²) = 0.01092<1

The sum of the MPE ratios is less than 1, the test result is passed.

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